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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

HIROSHI FURUKAWA *et al.*

Application No.: 10/791,452

Filed: March 1, 2004

For: STORAGE SUBSYSTEM,
STORAGE SYSTEM, AND
COMMUNICATION CONTROL
METHOD

Customer No.: 20350

Examiner: Unassigned

Technology Center/Art Unit: 2180

Confirmation No.: 3451

**PETITION TO MAKE SPECIAL FOR
NEW APPLICATION UNDER M.P.E.P.
§ 708.02, VIII & 37 C.F.R. § 1.102(d)**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a petition to make special the above-identified application under MPEP § 708.02, VIII & 37 C.F.R. § 1.102(d). The application has not received any examination by an Examiner.

(a) The Commissioner is authorized to charge the petition fee of \$130 under 37 C.F.R. § 1.17(i) and any other fees associated with this paper to Deposit Account 20-1430.

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(b) All the claims are believed to be directed to a single invention. If the Office determines that all the claims presented are not obviously directed to a single invention, then Applicants will make an election without traverse as a prerequisite to the grant of special status.

(c) Pre-examination searches were made of U.S. issued patents, including a classification search and a computer database search. The searches were performed on or around September 9, 2004, and were conducted by a professional search firm, Kramer & Amado, P.C. The classification search covered Class 711 (subclasses 151, 161, and 163) and Class 713 (subclasses 193 and 202) for the U.S. and foreign subclasses identified above. The computer database search was conducted on the USPTO systems EAST and WEST. The inventors further provided two references considered most closely related to the subject matter of the present application (see references #5-6 below), which were cited in the Information Disclosure Statements filed on March 1, 2004.

(d) The following references, copies of which are attached herewith, are deemed most closely related to the subject matter encompassed by the claims:

- (1) U.S. Patent No. 4,413,328;
- (2) U.S. Patent No. 4,947,318;
- (3) U.S. Patent No. 6,728,844 B2;
- (4) U.S. Patent No. 6,779,083 B2;
- (5) European Patent Publication No. EP 1,117,028 A2; and
- (6) Japanese Patent Publication No. JP 2001-265655.

(e) Set forth below is a detailed discussion of references which points out with particularity how the claimed subject matter is distinguishable over the references.

A. Claimed Embodiments of the Present Invention

The claimed embodiments relate to communication between a host computer and a storage subsystem and, more particularly, to a filtering technology and a communication cut off technology in communication at the time of an access from the host computer to a logical unit in the storage subsystem.

Independent claim 1 recites a storage subsystem which is connected to a host computer through a communication line. The storage subsystem comprises an interface which is used for connecting to the communication line, wherein the interface comprises a first filter which judges, on the occasion of having received communication packets from the communication line, whether there is a communication packet with a predetermined format for use in an access to the storage subsystem, among the communication packets. The interface further comprises a traffic measuring and judging unit which measures traffic of all communication packets received in the interface, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judges whether a communication failure is generated or not, and a communication failure alerting unit which alerts a management server connected to the storage subsystem and comprises a function of displaying information alerted, in case that it is judged that a communication failure is generated in the traffic measuring and judging unit.

Independent claim 9 recites a computer readable storage medium including a program for a computer mounted on a storage subsystem connected to a host computer through a communication line. The program comprises code for connecting to the communication line; code for judging, on the occasion of having received communication packets from the communication line through connecting to the communication line, whether there is a communication packet with a predetermined format for use in an access to the storage subsystem, among the communication packets; code for receiving the communication packet judged to be for the access in the judging, and judges whether it is a communication packet permitted to access to a storage area in the storage subsystem and transmitted from the host computer or not; code for measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and code for alerting a

management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all communications packets received in connecting to the communication line.

Independent claim 12 recites a computer readable storage medium including a program for a computer mounted on a management server which is connected to a storage subsystem. The program comprises code for referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure.

Independent claim 13 recites a computer readable storage medium including a program for a computer mounted on a management server which is connected to a storage subsystem. The program comprises code for referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure, and code for controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source.

Independent claim 15 recites a storage system in which a storage subsystem, a host computer, and a management server are connected by a communication line. The storage subsystem comprises an interface which connects to the communication line. The interface comprises, a first filter which judges, on the occasion of having received communication packets from the communication line, whether there is a communication packet with a predetermined format for use in an access to the storage subsystem, among the communication packets, a second filter which receives the communication packet judged to be for the access in the first filter, and judges whether it is a communication packet permitted to access to a storage area in the storage subsystem and transmitted from the host computer or not, a traffic measuring and judging unit which measures traffic of all communication packets received in the interface, and traffic of a communication packet judged not to be the packet with the format, respectively, and by using the both traffics, judges whether a communication failure is generated or not, a communication failure alerting unit which alerts the management server, in case that it is judged that a communication failure is generated in the traffic

measuring and judging unit, and a traffic log recording unit which records, as a traffic log, communication information of a communication packet judged not to be the communication packet with the format in the first filter and a communication packet judged not to be the communication packet transmitted from the host computer permitted to access in the second filter. The management server comprises a display device which displays the alert received from the communication failure alerting unit, an improper communication source analyzing unit which refers to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searches a source of the communication packet which causes the communication failure, and a relay device control unit which controls, based on information of a source searched in the improper communication source analyzing unit, a relay device which relays communication to the storage subsystem disposed on the communication line so as to cut off communication from the source.

Independent claim 19 recites a communication control method in a storage system in which a storage subsystem, a host computer, and a management server are connected by a communication line. The method comprises judging, when communication packets from the communication line were received in the storage subsystem, whether there is a communication packet with a predetermined format for use in an access to the storage subsystem, among the communication packets, measuring traffic of all communication packets received by the storage subsystem, and traffic of a communication packet judged not to be the packet with the predetermined format, respectively, and recording a traffic log of a communication packet judged not to be the communication packet with the format, judging, by using the measured both traffics, whether a communication failure is generated or not, and alerting the management server, in case that it is judged that a communication failure is generated, referring to the traffic log, in case that the alert that the communication failure is generated is received in the management server from the storage subsystem, and searching information of a source of the communication packet which causes the communication failure, and controlling, based on information of the searched source, a relay device which relays communication to the storage subsystem disposed on the communication line so as to cut off communication from the source.

Independent claim 20 recites a storage system having a storage subsystem connected to a host computer through a communication line, and a management server connected to the storage subsystem. The storage subsystem comprises an interface which connects to the communication line and a maintenance terminal which maintains the storage subsystem. The interface comprises a first filter which judges, on the occasion of having received communication packets from the communication line, whether there is a communication packet with a predetermined format for use in an access to the storage subsystem, among the communication packets, a second filter which receives the communication packet judged to be for the access in the first filter, and judges whether it is a communication packet permitted to access to a storage area in the storage subsystem and transmitted from the host computer or not, a traffic measuring and judging unit which measures traffic of all communication packets received in the interface, and traffic of a communication packet judged not to be the communication packet permitted to access in the second filter, respectively, and calculates a value of a ratio of the both traffics (communication ratio), and by using the both traffics, judges whether a communication failure is generated or not, and a communication failure alerting unit which alerts the maintenance terminal, in case that it is judged that a communication failure is generated in the traffic measuring and judging unit, of that failure is generated and the communication ratio. The maintenance terminal comprises a warning message reporting unit which generates, in case that the alert of that a communication failure is generated and the communication ratio is received from the communication information and failure alerting unit, a warning message in accordance with the alert, and outputs it to the management server. The management server comprises an output device, a failure information displaying unit which comprises the output device displayed the warning message and the communication ratio received from the warning message reporting unit, and a QoS condition designating unit which judges whether the communication ratio is within a predetermined permissible zone, and in case that it is judged to be outside the permissible zone, adjusts a network QoS of a relay device which relays communication to the storage subsystem disposed on the communication line.

One of the benefits that may be derived is that it is possible to heighten security in a storage subsystem connected to a communication line, and to secure a network QoS to a storage subsystem.

B. Discussion of the References

1. U.S. Patent No. 4,413,328

This reference relates to a storage subsystem that employs removable media with a display at each recorder, and controls the display in such a manner as to enhance subsystem operation by reducing operator error and increase data and subsystem security. See column 1, lines 60-65.

The reference does not teach measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and alerting a management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all communications packets received in connecting to the communication line, as recited in independent claims 1, 9, 15, 19, and 20. Nor does it disclose referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure, as recited in independent claim 12. The reference also fails to teach referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure; and controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source, as recited in independent claim 13.

2. U.S. Patent No. 4,947,318

This reference discloses that when the storage volume is loaded into a storage unit, the data protection information stored in the storage volume is automatically read out of the storage volume and stored in a memory of the storage unit by the internal control unit of the storage unit, and the data protection information stored in the memory is correlated with an access request for data in the storage volume to check the validity of the data access so

that the specified data in the storage volume is protected from an invalid or unjust access without the aid of host computer or operation by the operator.

The reference does not teach measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and alerting a management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all communications packets received in connecting to the communication line, as recited in independent claims 1, 9, 15, 19, and 20. Nor does it disclose referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure, as recited in independent claim 12. The reference also fails to teach referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure; and controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source, as recited in independent claim 13.

3. U.S. Patent No. 6,728,844 B2

This reference discloses a standardized fiber channel as an interface between one or more host computers and a storage control device. It also includes host computers and a storage control device plus more than one storage device operable under control of the storage control device, wherein the fiber channel connection storage control device has a security function in the environment capable of physically receiving any access from the host computers, and eliminating or deterring unauthorized access attempts from the host computers to the storage control device, which did not have any means for rejecting unauthorized access from host computers. See column 2, lines 10 –20.

The reference does not teach measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and alerting a management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all communications packets received in connecting to the communication line, as recited in independent claims 1, 9, 15, 19, and 20. Nor does it disclose referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure, as recited in independent claim 12. The reference also fails to teach referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure; and controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source, as recited in independent claim 13.

4. U.S. Patent No. 6,779,083 B2

This reference discloses that in this storage subsystem, a user can make setting of accessible LUN and setting on a connection interface in an arbitrary group unit of computers under a single port without changing existing processing, limitation and other functions of the computers. Therefore, this storage subsystem can accomplish an access control function, that is, a LUN security function, for computer groups having a plurality of kinds of OS under a single port.

The reference does not teach measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and alerting a management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all

communications packets received in connecting to the communication line, as recited in independent claims 1, 9, 15, 19, and 20. Nor does it disclose referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure, as recited in independent claim 12. The reference also fails to teach referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure; and controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source, as recited in independent claim 13.

5. European Patent Publication No. EP 1,117,028 A2

This reference relates to techniques for performing security functions in computer storage subsystems in order to prevent illegal access by the host computers according to logical unit (LU) identity. Management tables can be used to disclose the Logical Unit in the storage subsystem to the host computers in accordance with the user's operational needs. In a specific embodiment, accessibility to a storage subsystem resource can be decided when an Inquiry Command is received, providing systems and apparatus wherein there is no further need to repeatedly determine accessibility for subsequent accesses to the Logical Unit.

The reference does not teach measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and alerting a management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all communications packets received in connecting to the communication line, as recited in independent claims 1, 9, 15, 19, and 20. Nor does it disclose referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet

which causes the communication failure, as recited in independent claim 12. The reference also fails to teach referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure; and controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source, as recited in independent claim 13.

6. Japanese Patent Publication No. JP 2001-265655

This reference discloses a technique to provide a security function in a storage subsystem using the flexible and efficient presentation method of storage resources by performing execution with high-speed judgment logic without affecting a processing on the side of a host computer. An information WWN for uniquely identifying the host computer, a management table where the correspondence of a logical unit number LUN inside the storage subsystem for which access is permitted to the host computer and a virtual LUN for presenting the LUN to be the access object to the host computer by a user optional method is described and the management table where the correspondence of the WWN and a dynamically allocated management number S-ID is described are stored in a nonvolatile memory inside the storage subsystem beforehand.

As discussed in the present application at page 1, line 22 to page 3, line 5, the storage system as disclosed in the reference comprises, on a nonvolatile memory in a storage subsystem, in addition to a LUN access management table which manages a WWN (World Wide Name) as information which uniquely identifies a host computer, a LUN (logical Unit Number) as a number of a logical unit in a storage subsystem which permitted an access from the host computer, and a virtual LUN as a number of a virtual LU that a user or an operating system on the host computer arbitrarily assigned in parallel with the LUN, by associating them one another. In such communication that the host computer accesses to the storage subsystem, the storage system further comprises a WWN-S-ID management table which manages a S-ID (Source ID) as a management number which is dynamically assigned at the time of log-in and which is always constant during the host computer is in operation, and the WWN of the host computer, by associating them each other.

In the storage system, with reference to these two management tables, right and wrong of an access to a logical unit is judged at the time point of generation of an inquiry command at the time of log-in. After that, there is no necessity to repeat this judgment. On this account, it is possible to limit right and wrong of an access with each of a logical unit, over maintaining and operating a storage subsystem with high performance, which realizes strong security. In this regard, however, the storage system disclosed in the reference is a system which was built up by a dedicated network, such as a SAN (Storage Area Network) in which a host computer and a storage subsystem are connected to be networked by using a dedicated interface called as Fiber Channel (FC). Therefore, it is a premise that only a SCSI command, which is a command set for an access from a host computer to a storage subsystem, is transmitted to a storage subsystem.

The reference does not teach measuring traffic of all communication packets received in connecting to the communication line, and traffic of a communication packet judged not to be the packet with the format in the first filter, respectively, and by using the both traffics, judging whether a communication failure is generated or not; and alerting a management server connected to the storage subsystem and displaying information alerted, in case that it is judged that a communication failure is generated in measuring the traffic of all communications packets received in connecting to the communication line, as recited in independent claims 1, 9, 15, 19, and 20. Nor does it disclose referring to the traffic log, in case that it is alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure, as recited in independent claim 12. The reference also fails to teach referring to the traffic log, in case that it was alerted from a communication failure alerting unit of the storage subsystem that a communication failure is generated, and searching a source of the communication packet which causes the communication failure; and controlling, based on information of a source searched in the searching, a relay device which relays communication to the storage subsystem disposed on the communication line for receiving a communication packet so as to cut off communication from the source, as recited in independent claim 13.

(f) In view of this petition, the Examiner is respectfully requested to issue a first Office Action at an early date.

Respectfully submitted,



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Attachments

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